

## Microscopic Analysis and Modeling of Airport Surface Sequencing

**Mosaic ATM, Inc.**

### Technical Abstract

Although a number of airport surface models exist and have been successfully used for analysis of airport operations, only recently has it become possible to conduct detailed validation of such models through the use of airport surface surveillance data. In this effort, we propose to go a step further than existing models, by actually incorporating empirically-derived airport surface control practices into NASA's overall airport simulation modeling capability. This effort will produce tools to support fundamental research of the concept and requirements for airport operations in the Next Generation Air Transportation System (NextGen) by providing microscopic airport surface modeling components that provide higher fidelity and greater validity of modeling than previously available. Through this effort we will use the Surface Operations Data Analysis and Adaptation (SODAA) tool to conduct detailed analysis of airport surface operations using actual data.

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## Rapid Estimation of Aircraft Performance Models using Differential Vortex Panel Method and Extended Kalman Filter

### Optimal Synthesis

### Technical Abstract

The problem of estimating the aerodynamic models for flight control of damaged aircraft using an innovative differential vortex lattice method tightly coupled with an extended Kalman filter was investigated during the Phase I research. The approach exploited prior knowledge about the undamaged aircraft to reduce the order of the estimation problem. Probing maneuvers were designed to improve the observability of the system dynamics. The derived performance model was then be used to determine the aircraft flight envelope, performance parameters and the maneuver limits. The estimated data can be used as the basis for designing safe landing guidance laws for damaged aircraft. Phase II research will refine the algorithms developed during the Phase I research and create a standalone software implementation. Structural dynamic computations and control power estimation will be included in the software. Operation of the software will then be demonstrated at near real-time speeds. All the algorithms and software developed under the proposed research will be supplied to NASA at the end of Phase II. Human-in-the-loop simulations and flight test evaluation of the system will be undertaken during the Phase III work.

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